Networks and EMS (NES) Roadmap
Navy EW and Cyber Convergence

2011 DoD Spectrum Workshop

16 DEC 11

Call to Action

"In the next two decades, the [electromagnetic] environment may become our most critical warfighting arena. Control of information -- much of it through the EM spectrum -- is already growing more important than control of territory in modern warfare."

- ADM Jonathan Greenert, CNO, 10 October 2011

"The future Fleet will maintain our current advantages in the electromagnetic spectrum and cyberspace, but will fully operationalize them as warfighting domains."

- CNO, Navy 2025: Forward Warfighters, Proceeding Magazine, Dec 2011

CNO's Sailing Directions

"Cyberspace will be operationalized with capabilities that span the electromagnetic spectrum – providing superior awareness and control when and where we need it."

- CNO's Sailing Directions, SEP 2011

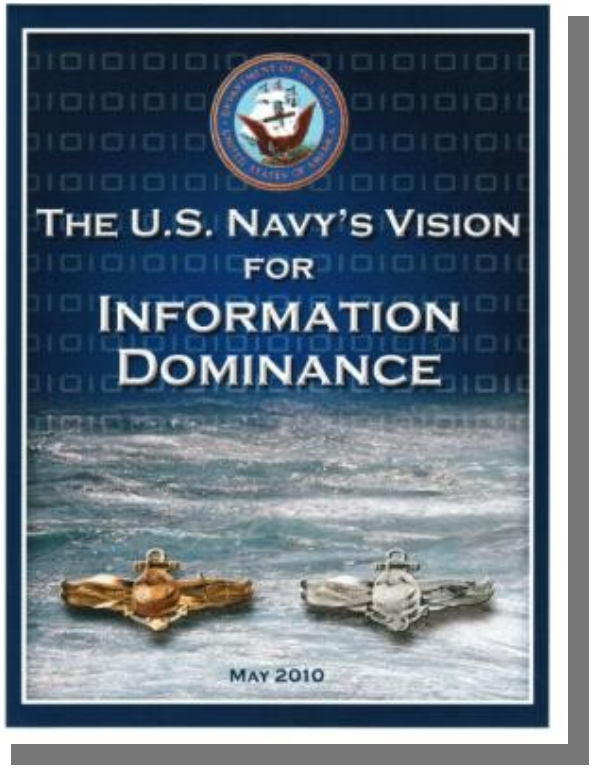
Senior leaders understand the risks and challenges

Enabling the Information Dominance Vision

Support the Information Dominance Vision with a single unified information environment across tactical, operational and strategic-level spectrum management and networks to assure the commander and warfighter get the right information at the right time

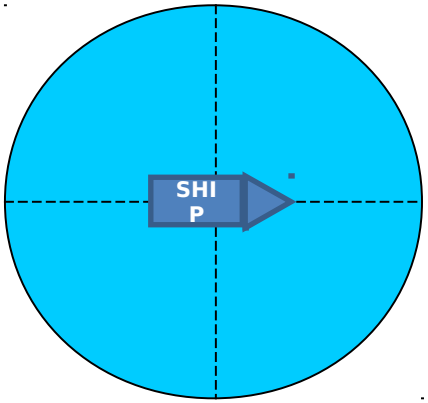
Key features of NES approach:

- Assured C2 of existing networks and communication infrastructure
- Phased approach to automated, real-time spectrum operations
- Network architecture and data strategy that establishes the grid
- Enterprise services that facilitate information discovery and sharing
- Authorities, oversight, standards and training that instill unity of



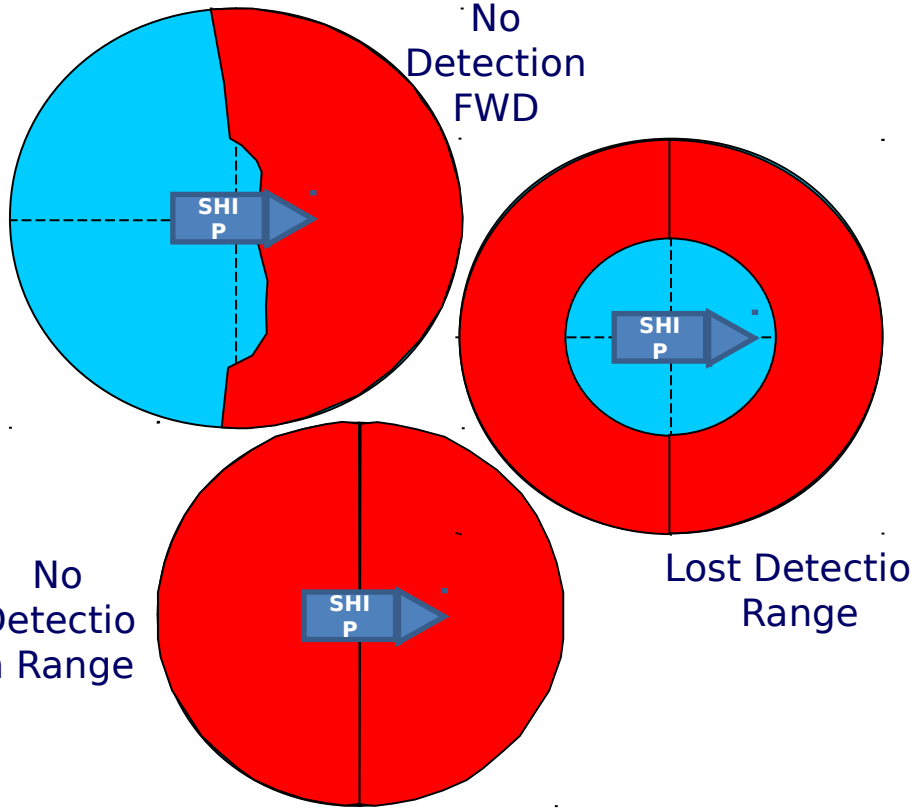
The Hidden Problem
Obscured EMI Impacts

- Ship operator assumes system 100% capable
- Actual System Operational Capability



Detection Range: XX nautical miles, full 360 degrees

REALITY



Goal: Make the Assumption the Reality

NES Wholeness / Integration

Networks

Touch Points to all Roadmaps:

- Network Management
- Transport Grid
- Common Connectivity Bus
- Agile Routing
- Fleet Network Operations Center Afloat
- Net-Centric Enterprise Services
- Mobile GIG Entry Points
- DoD IT Enterprise Strategy

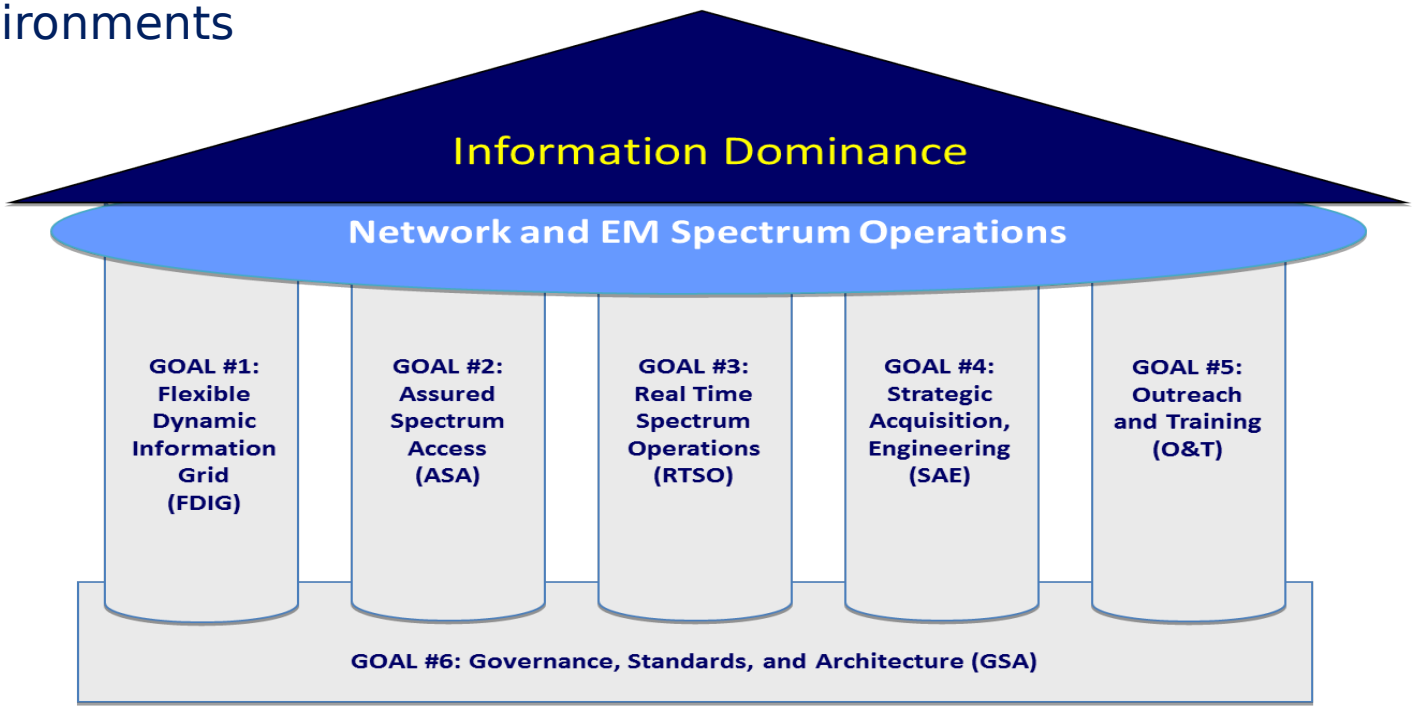
Electromagnetic Spectrum

Touch Points to all Roadmaps:

- Congressional Inventory
- National Broadband Plan
- Assured Spectrum Access
- Real Time Spectrum Ops
- Improve SPY-1 Interoperability
- Linkage to NTAs
- Denied Environments
- World Radio Conference agenda items (ex., UAS Allocation, HF Radars)

NES Vision and Goals

- Develop and establish a complete portfolio of reliable, highly-interoperable network and electromagnetic spectrum capabilities
- Manage through a flexible, dynamic information grid that maximizes the ability of the warfighter to access, maneuver, and achieve decision superiority in, A2AD, benign, degraded and denied environments

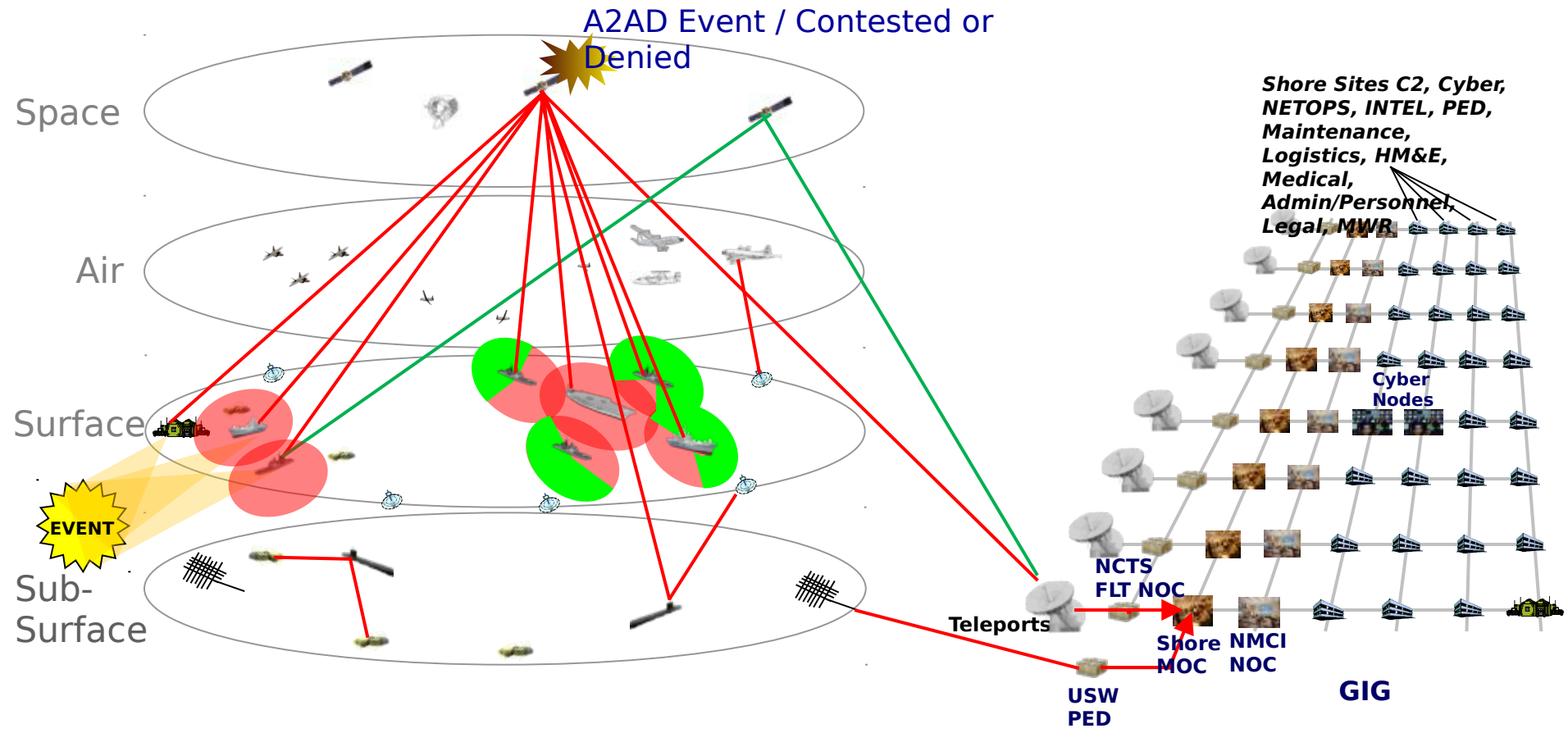

Information Dominance
Network and EM Spectrum Operations
GOAL #1: Flexible Dynamic Information Grid (FDIG)
GOAL #2: Assured Spectrum Access (ASA)
GOAL #3: Real Time Spectrum Operations (RTSO)
GOAL #4: Strategic Acquisition, Engineering (SAE)
GOAL #5: Outreach and Training (O&T)
GOAL #6: Governance, Standards, and Architecture (GSA)

Links to NES and Spectrum Maps

https://www.intelink.gov/wiki/Networks_and_Electromagnetic_Spectrum_(NES)_Roadmap
https://www.intelink.gov/wiki/EM_Spectrum_Usage_Roadmap

NES Overarching View

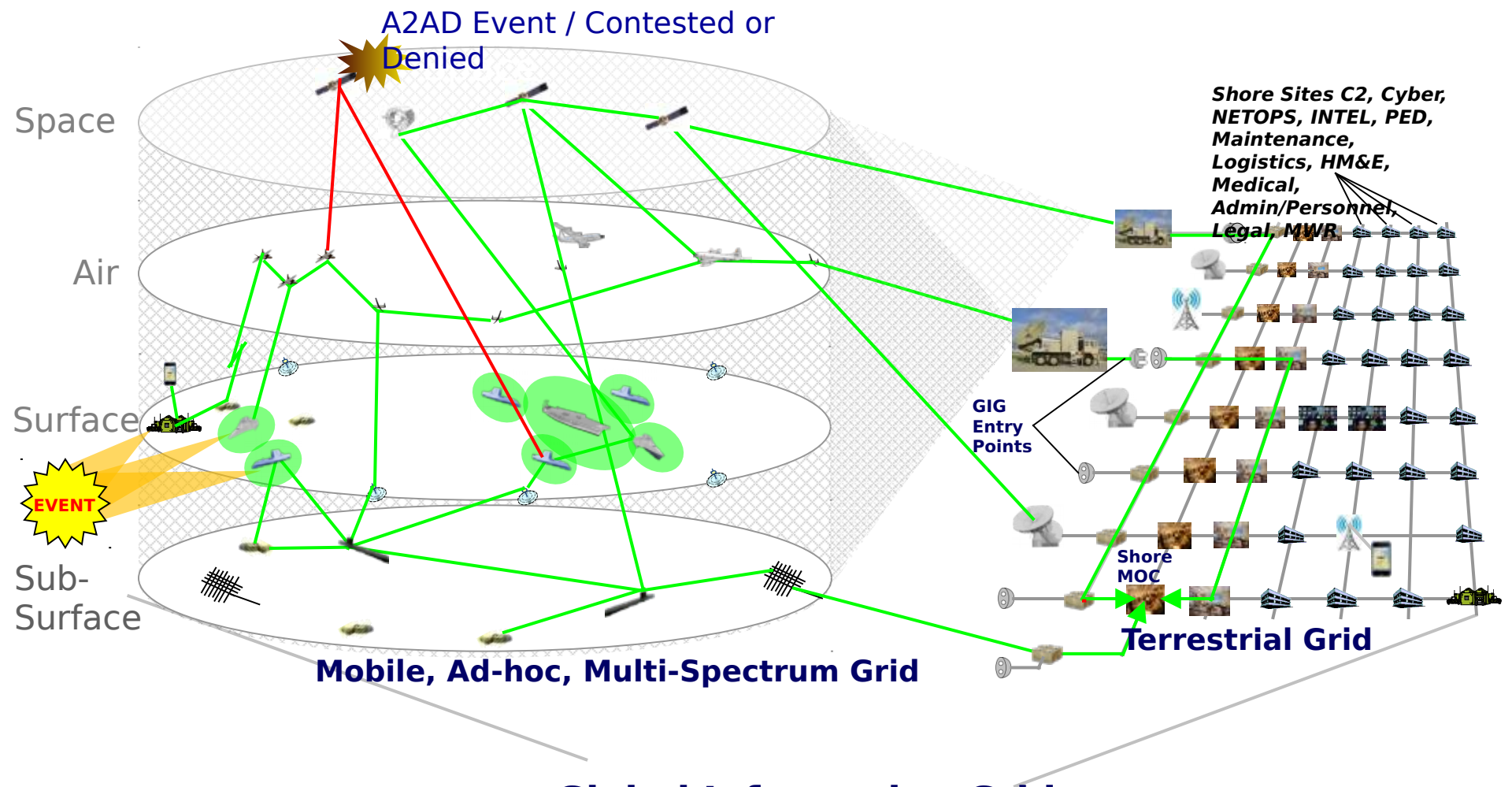
As-Is 2011



Point-to-point comms, specialized comms relays, reliance on Space Layer for connection to GIG, platforms are degraded

NES Overarching View

To-be Vision 2025



Global Information Grid

Every node connects to the Grid, every node supports the Grid, Platforms have full combat capability

Real-Time Spectrum Operations (RTSO)

TODAY	INCR. 1	INCR. 2	INCR. 3
Man in the Loop (MIL) Minutes	Man on the Loop (MOL) Seconds	Combat Systems (MIL) LOS COMMS (MOL)	Machine to Machine (M2M) Milliseconds

RTSO enables interoperable Core Capabilities

COMUSFLTFORCOM – 2011 Fleet EW Integrated Prioritized Capabilities List (IPCL)
Specifically highlights Spectrum Management and Real-Time Spectrum Operations (RTSO) concept development as a priority.

National Broadband Plan (NBP)

Spectrum Bands Being Considered (Goal #2: ASA)

— Band Study Prioritizations

L — Low - Reallocation Impacts minimal

M — Medium - Reallocation Impacts significant

H — High - Reallocation Impacts Critical, band should not be pursued

NTIA Top Priority Bands

Band MHz	Reallocation Impacts	Key Navy and DOD Systems	Other Federal Users
406.1 – 420	3	Non-Tactical Land Mobile Radio Systems	DOC, DHS, GSA, DOJ
1300 - 1390 (1370 – 1390)	4	Long Range Search Radars, Range Data Links, Cobra Dane, Tactical Comms (SRC-57 / MRC-142) Lightweight Counter Mortar Radar (Army), GPS	FAA, DHS, NSF, TVA, NASA
1675 – 1695 (Fast Track 1695 – 1710)	2	Meteorological Satellite (GOES) downlinks and Radiosondes	DOC, NOAA, NASA
1755 - 1780	1	Space Ground Link Subsystem (SGLS uplink); UAVs – Pointer, Raven, others; Tactical Comms (HCLOS, DWTS, SRC-57); Air Combat Training Systems; Precision Guided Munitions (PGMs); Sustaining Base Operations	DOJ, DOA, DOC, DHS, DOE, FAA, DOI, NASA, TVA, NSF, VA, HUD
1780 - 1850			DOJ, DOA, AID, DOC, DHS, DOE, EPA, FAA, HHS, HUD, DOI, OPM
2200 – 2290		Missile telemetry, Airborne telemetry, Space Ground Link Subsystem (SGLS downlink)	DOA, DOC, DHS, GSA, DOI, DOT, DOJ
2700 – 2900		Ground and Maritime Air surveillance radars, future Navy radars	FAA, NOAA, DOE
2900 - 3100		Ground penetrating and weather radars, Maritime Navigational radars, future Navy radars (BMD)	NOAA, DOE
3100 - 3500	6	DDG/CG Aegis SPY-1 Weapon System (Radar and Missile guidance); Army Fire Finder counter battery radar; Airborne radar; future Navy radars (BMD)	DOE
3500 – 3650 MHz	5	Airborne Station Keeping Equipment,	

Reallocation impacts determined by OPNAV, Fleet, and PEO

Lexicon Challenges

Conventional Wisdom

- Cyber is IP based communications
- EW is radars and missile seekers
- SIGINT is communications signals
- Electromagnetic spectrum = RF only
- Cyberspace is a domain

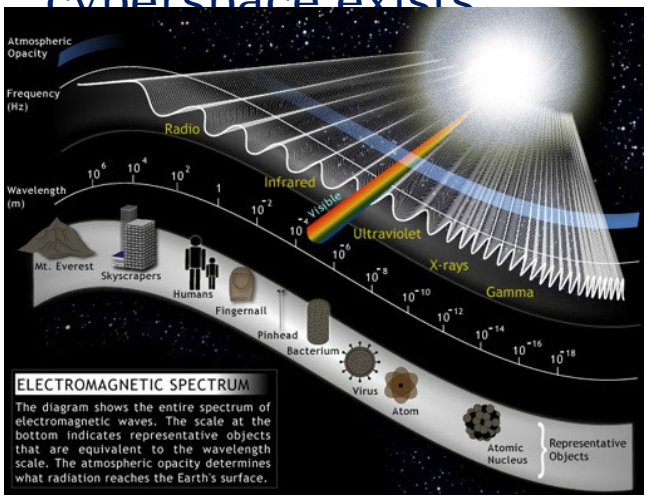
Hard to define new things with old language

The Lexicon Matters...

- Cyber is the language of the 21st Century, but have we got the terminology correct?

-- What is “cyber”? Where does it begin and end? Is it really the domain, or is the EMS the “domain”?

-- The EMS is more than just RF, and underpins cyberspace. It’s the physical environment in which cyberspace exists



- When we talk convergence, convergence of what?

-- Technological convergence between wired, wireless and optical?

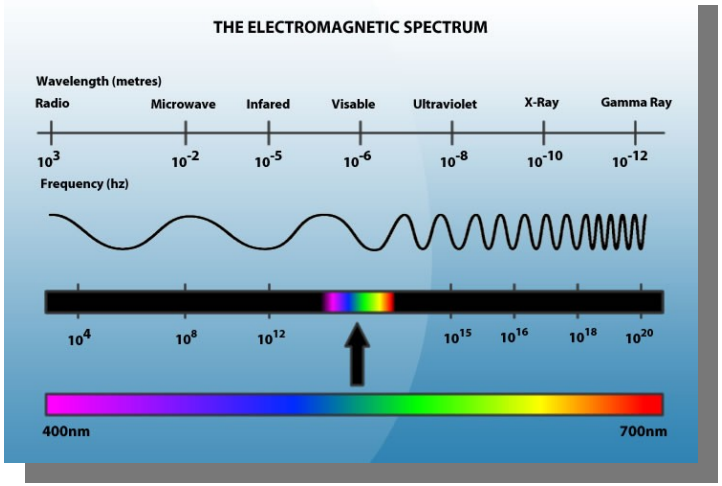
-- Operational employment of EW and cyber capabilities? EA and CNA -- OCO and ES -- SIGINT and CNE

Common understanding and application of terminology

Concept

Operational Fires in the Electromagnetic Spectrum

Operational Fires in the EMS



- Targeting/Counter Targeting
- C2/Counter C2
- Delivery/Counter delivery
- Real Time Spectrum Ops
- EW Battle Management

Ships

Aircraft

SpecWar

Submarines

Navy provides tactical entry points to the EMS for a variety of missions

Electronic & Cyber Warfare Plan

Modernize and converge Electronic & Cyber Warfare (E/CW) to influence, control, and when needed, fight and win in the EMS

- Investing for near-term E/CW capability & long term capacity
- Fielding capabilities for “fires” through the EMS
- Providing E/CW readiness

Building the ECW future for operating in the information environment

Achieving Convergence

- Workforce adjustments required:
  - Historically, EW and CNO were separate and distinct skill sets.
  - What's the future? EW and cyberspace operations still separate, but less distinct?
- TTP development needed
- EW systems used for cyber mission
  - Surface EW systems such as SSEE-F are "cyber" ready
- Changes to roles and missions
  - Move beyond current focus on NETOPS/CND
- Authorities and governance need revision
  - EW can enable unique cyber "non-kinetic fires"
- Implications for Navy's Title 10 Man, Train and Equip responsibility

EW-Cyber convergence for all phases of warfighting and mission areas